3. REMEDIAL DESIGN

3.1 Project Site

This section describes the remedial design for OU 5-12, which was developed in accordance with the engineering design criteria presented in Section 2. The civil design drawings and specifications for the action are included in Appendices A and B, respectively. The following sections summarize the major aspects critical to the remedial design.

3.2 Physical Site Description

The following sections describe the ARA-02 Sanitary Waste System, ARA-16 Radionuclide Tank, the inactive waste system sites, and the ARA-25 soils and foundation.

3.2.1 ARA-02 Sanitary Waste System

ARA-02 is a sanitary septic system that serviced the ARA-I facility from 1960 to 1988 (Figure 3-1). The ARA-02 site is defined as the entire septic system, including the three tanks (one septic tank, one settling tank, and one chlorine contact tank), the seepage pit, three manholes, and all associated piping leading from source buildings (both 10- and 20-cm [4- and 8-in.] diameter), as well as any contiguous soil contaminated from system materials. The septic system serviced the ARA-I Buildings 626, 627, and 628 and Office Trailers No. 1 and 2 outside the ARA-I facility fence. The vertical extent of the site is defined by the depth to the soil/basalt interface.

The ARA-02 Sanitary Waste System includes 10.1-cm (4-in.) diameter piping leading from each of the aforementioned buildings and trailers into a 20.3-cm (8-in.) diameter concrete main with mechanical joints, three septic tanks, and an associated seepage pit discharge point. Three manholes allow access to the 20.3-cm (8-in.) diameter concrete main. The 20.3-cm (8-in.) diameter main continues eastward to the seepage pit. The third manhole accesses the mainline pipe approximately halfway between the second manhole and the seepage pit. The mainline lies approximately 1.0 to 1.2 m (3.3 to 4 ft) below ground surface (bgs) along its entire length of approximately 218 m (715 ft).

The tanks lie approximately 1.1 m (3.5 ft) bgs. The first tank in the series is approximately 3.0 m (10 ft) east of the second manhole. The first tank is a septic tank constructed of concrete and has 1.5-m (5-ft) vertical depth and a 3,029-L (800-gal) capacity. The second concrete settling tank lies approximately 0.3 m (1 ft) east of the first tank, has a capacity of 1,893 L (500 gal), and is approximately the same depth as the first tank. The third tank is a 1,893-L (500-gal) capacity, precast chlorine contact tank located approximately 0.3 m (1 ft) further east of the second tank and again at the same depth. The construction of the three tanks allowed for a maximum accumulation of 1.2 m (4 ft) of liquids and sludges with a 0.3-m (1-ft) air space above the mainline inlet and outlets. The tanks are accessed by means of two rectangular concrete ports located directly above the baffles near each end of the tanks.

The mainline piping continues eastward from the chlorine contact tank to the third manhole, a distance of approximately 67 m (220 ft) from the second manhole. The seepage pit is located an additional 69 m (226 ft) east of the third manhole. The seepage pit is accessed via a cast iron manhole approximately 0.8 m (2.5 ft) bgs. The top of the mainline pipe inlet to the seepage pit lies approximately 1.1 m (3.6 ft) bgs (assuming a 0.2 m [0.75 ft] overburden depth). The seepage pit is constructed of 20.3-cm (8-in.) open dry-joint pumice blocks lying on concrete pilings 1.8 m (6 ft) below the mainline tract. Screened gravel (3.8 cm [1.5 in.] in size), 0.4 m (1.3 ft) thick, surrounds the seepage pit below the mainline inlet, while a 0.3-m (1-ft) thick gravel bed lies below the open base of the pit.

3.2.2 ARA-16 Radionuclide Tank

Located at ARA-I, the ARA-16 Radionuclide Tank is a 3,785-L (1,000-gal) stainless steel underground tank that rests on a 15-cm (6-in.) gravel bed inside an open-topped concrete vault (Figure 3-2). The tank is 3.66 m (12.0 ft) long and approximately 1.2 m (4 ft) in diameter. The external dimensions of the vault and configuration of the tank within the vault are provided on Drawing Sheet C-9 in Appendix A. The tank has been partially excavated in the past for sampling; therefore, the current depth of the fill material varies from the original design.

The tank has several piping connections and a manway cover. A pump and all external piping were removed from the tank, and a 10-cm (4-in.) diameter inlet pipe, which extended out the end of the tank and through which waste entered the tank, was cut just outside the concrete vault with the ends capped off. An isolation valve is located just beyond the cut inlet pipe. From where the pump was removed, the 15-cm (6-in.) diameter pump suction line was blind flanged at approximately 91 cm (36 in.) below grade. A 5-cm (2-in.) diameter line and a 3.8-cm (1.5-in.) diameter line next to the manhole were cut approximately 61 cm (24 in.) above the tank and capped. Two 3.175-cm (1.25-in.) diameter pipe nipples are also located next to the manhole. A 5-cm (2-in.) diameter line and a 2.54-cm (1-in.) diameter line that are welded to the manhole were cut approximately 46 cm (18 in.) above the tank and blind flanged.

The ARA-16 Radionuclide Tank was connected to Buildings ARA-626 and ARA-627 within the ARA-I facility via stainless steel piping. The Building ARA-627 drainline is a 10-cm (4-in.) diameter pipe with a length of 32 m (105 ft). This line is connected by a Y-joint to a 10-cm (4-in.) diameter pipe that ran 68 m (223 ft) to the Building 626 Hot Cell. Within the Building 626 Service Area were a series of drainlines including 14 m (47 ft) of 10-cm (4-in.) diameter pipe and 39 m (127 ft) of 5-cm (2-in.) diameter pipe.

3.2.3 Inactive Waste Systems

3.2.3.1 ARA-07: ARA-II Seepage Pit to East (ARA-720A). The ARA-07 seepage pit (Figure 3-3) is constructed of 20.3 × 20.3 × 40.6-cm (8 × 8 × 16-in.) pumice blocks laid on their side in the shape of a circle. The seepage pit has a diameter of 4 m (13 ft) and a depth of 3.0 m (10 ft). The top two courses of pumice blocks are set in mortar. The as-built drawing (#102832) shows the first course of blocks to be set on bedrock leveled with concrete. The pit has a gravel base and contains approximately 15 to 30-cm (6 to 12-in.) of sludge. The top of the pit extends above the ground and is covered by a wooden roof with lifting rings and a 0.6 × 0.6-m (2 × 2-ft) square access port. A 1.2-m (4-ft) high chain-link fence surrounds the entire structure.

The seepage pit lies just outside of the ARA-II facility fence and was the terminus of two septic tanks serving the Administration Building (Building 613) and the Technical Support Building (Building 602). The seepage pit was also thought to be the terminating point for an underground waste detection tank (ARA-719). The system was in use from approximately 1959 to 1986.

3.2.3.2 ARA-08: ARA-II Seepage Pit to West (ARA-720B). The ARA-08 seepage pit (Figure 3-3) is an inactive seepage pit with a diameter of 4 m (13 ft) and a depth of 3 m (10 ft). The pit is constructed of 20.3 × 20.3 × 40.6-cm (8 × 8 × 16-in.) pumice blocks laid on their side in the shape of a circle. The top two courses of pumice blocks are set in mortar. The pit has a gravel base and contains approximately 46 to 61 cm (18 to 24 in.) of sludge. Three separate concrete slabs measuring

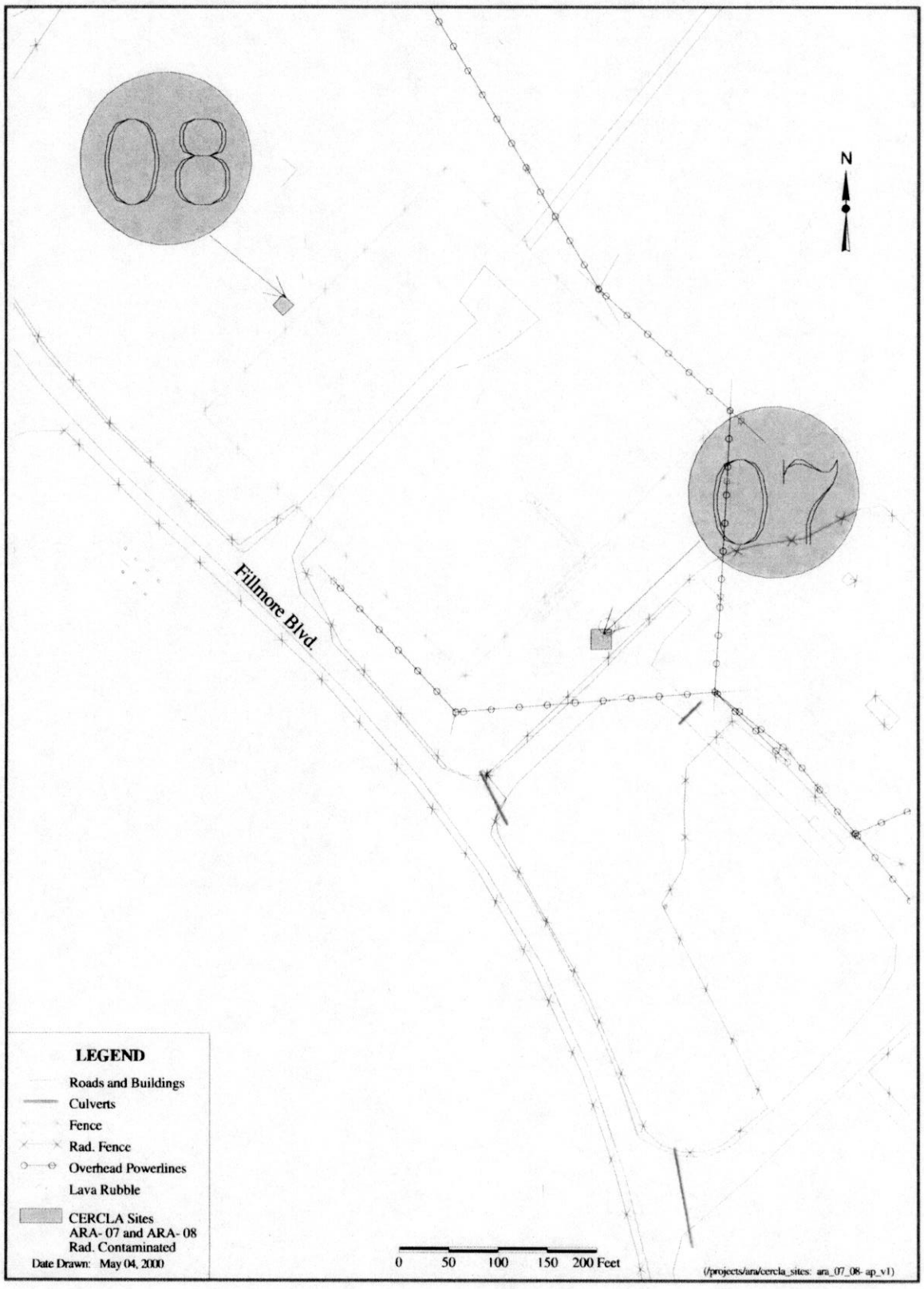

Figure 3-3. ARA-07 and ARA-08 Seepage Pits.

approximately 0.9 m (3 ft) wide by 3.0 m (10 ft) long cap the pit. The pit is covered by approximately 0.9 m (3 ft) of soil.

The seepage pit lies just outside of the ARA-II facility fence and received wastes from the Administrative and Technical Support Building (Building 606). The system was in use from approximately 1959 to 1986.

3.2.3.3 ARA-13: ARA-III Sanitary Sewer Leach Field and Septic Tank (ARA-740). The ARA-13 site consists of a manhole, a septic tank, a distribution box, and a leach field (Figure 3-4). Sanitary waste was disposed of into the system from 1969 to 1980. In addition to sanitary waste, small quantities of laboratory waste were diverted to this system between 1980 and 1983.

The concrete manhole is approximately 1.5 m (5 ft) in diameter and extends approximately 1.2 m (4 ft) below grade. It has two inlets and a single outlet. The septic tank is rectangularly-shaped and is 7.0 m (23 ft) long, 1.8 m (6 ft) wide, and 1.8 m (6 ft) high with an approximate volume of 23,500 L (6,200 gal). The concrete septic tank is buried approximately 1.5 m (5 ft) bgs, directly on top of basalt that had to be blasted and excavated during installation. Effluent from the septic tank drained into a metal distribution box with dimensions of 2.7 m (9 ft) long, 1.5 m (5 ft) high, and 1.0 m (3.25 ft) wide with a volume of 4.1 m^3 (5.4 yd^3). The distribution box has nine screened outlets that drained into the 465 m^2 (5,000 ft^2) leach field.

3.2.3.4 ARA-21: ARA-IV Test Area Septic Tank and Leach Pit No. 2. The ARA-21 site (Figure 3-5) consists of a 3,785-L (1,000-gal) underground septic tank, an estimated 946- to 1,892-L (250- to 500-gal) chlorine contact tank, and a seepage pit that received sanitary waste from the ARA-IV Test Area Building (ARA-616). The system was used from approximately 1957 to 1970. During D&D operations in 1987, the piping was cut 3.0 m (10 ft) from the building, and the tanks and leach pit were covered with 1.8 m (6.0 ft) of soil.

3.2.4 ARA-25: ARA-I Soil Beneath the ARA-626 Hot Cells

The ARA-25 site comprises contaminated soil that was discovered beneath the ARA-626 Hot Cells during the D&D of the ARA-I facility in 1998 (Figure 3-6). The contamination was found near the hot cell floor drains. The contaminated area immediately around the drains measures approximately 2.4 × 3.7 m (8 × 12 ft). However, other isolated hot spots beneath the building were also discovered. Therefore, a cumulative size of 4.9 × 7.3 m (16 × 24 ft) was estimated for the site.

The ARA-I hot cells were constructed in 1959 and used until the facility was shut down in 1988. In addition to liquid radioactive waste such as wash water from the ARA-I hot cells, chemicals from materials testing and research and metal-etching processes were used at the facility. Stainless steel piping connected the floor drains to the ARA-729 Radionuclide Tank (Site ARA-16), which contains PCB-contaminated, RCRA F-listed mixed waste (40 CFR 261, Subpart D) and transuranic radionuclides. The pipes are included in the remediation of Site ARA-16 and are not a component of the ARA-25 site.

3.3 Site Preparation

Plot plans delineating the laydown and stockpile areas will be prepared prior to the commencement of field activities. The following sections describe the necessary preparations at each of the task sites.